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~~Application for Letters Patent~~

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~~A Method and AN Apparatus for packaging objects~~

[0001] This application claims priority from European Patent Application No. 00 117 108.1 filed August 9, 2000.

BACKGROUND OF THE INVENTION

[0002] The invention relates to a an apparatus and method for packaging objects using a hose-shaped stretch foil, ~~guided in run-like manner as hose of lateral folds in particular,~~

~~in accordance with the preamble of patent claim 1 as well as to an apparatus for packaging objects in accordance with the preamble of patent claim 8~~ **guided axially with respect to the stretch foil and along a length of an object to be packaged, e.g., such as a palletized stack of goods.** Such apparatuses and methods are used in particular for packaging stacks of goods arranged on pallets in order to give protection to the stack of goods during transport against humidity and other environmental influences in case of using a foil hood. Moreover, the wrapping of ~~said the~~ stack of goods with a foil hood or a band stock allots increased stability to the packaging unit, since the foil hood and/or band stock is stretched in horizontal and vertical direction when pulled over the stack of goods and after having been pulled over ~~bears on said the~~ stack of goods and ~~said,~~ **exerts a pressure on the stack of goods and the** pallet with tension.

[0003] From DE 39 21 190 C2 an apparatus is known for packaging objects in a hose-shaped plastic foil, in which a foil hood is reeled on gripper means **device** arranged on a vertical frame. Subsequently, ~~said the~~ gripper means **device** are moved apart in horizontal direction, this stretching the foil hood in horizontal direction. Shafts adjustable with respect to ~~said the~~ gripper means **device** and driven are provided for on ~~said the~~ frames and a continuously circulating band which is in contact with the outer surface of the shaft is arranged on each gripper means **device**. Due to the rotational movement of the shaft in one direction, the foil can be pushed onto the gripper means **device**. During the subsequent pulling-over of the foil hood over the stack of goods the foil hood can then be pulled down from the frame in controlled manner by the rotation of the shaft in opposite direction. This apparatus permits control of the vertical stretch of the foil, however, it turns out to be disadvantageous in this apparatus that the horizontal stretch of the foil on the upper surface of the objects to be packed is not sufficient. Consequently, excess stretching of the foil hood can be created when the gripper means **device** move apart after pushing over of the foil and stretch the foil hood horizontally. Thus, in those positions of the foil hood, in which the grippers engage with the hood and expand the latter, thin portions of the foil hood are created, i.e. endangered portions in particular in the corners of the stack of goods to be packaged. This problem can be avoided in known manner in that the gripper bows have a substantial length and a broad bearing

surface for the foil such that the expansion forces are distributed correspondingly. However, this solution has the disadvantage that the grippers for gripping the foil cannot be retracted to a small cross-section. Retraction to a cross-section as small as possible, however, is desired for reasons of space and is possible since the present-day foils permit high expansion even in case of low initial cross-sections of the hose.

The same problems result in case of a hose stretch open on top, so-called band stock, ~~cut to a suitable length.~~ **foil, cut to a suitable length.**

SUMMARY OF THE INVENTION

~~It is, therefore, the main~~[0004] An object of the present invention to create a method as well as an apparatus for packaging objects, which avoid the excessive stretching of the foil hood or band stock, respectively, and formation of thinned foil portions in the area of the upper surface of the good to be packed.

~~This object is solved by the method in accordance with claim 1 and by the apparatus in accordance with claim 8. Preferred embodiments of the invention are defined in the subclaims.~~

[0005] One of more of these and other objects are accomplished by a method for packaging an object with a hose-shaped stretch foil having laterally extending folds guided axially with respect to the foil and along a length of the object, the method including the steps of forming either a foil hood sized to the shape of the object to be packed or a band stock foil hose; reefing the foil hood or band stock, respectively, on several gripper device movable in essentially a horizontal direction and being engaged with reefing devices, of a lifting frame movable in essentially a vertical direction, wherein the reefing devices each include a respective roll being rotatably engaged with each of the gripper device; tentering the reefed foil hood or band stock, respectively, in essentially a horizontal direction by movement of the gripper device and a first rotation of the reefing devices such that the tentered opening of the foil hood or band stock, respectively, is larger than the contour of the object to be packed and wherein the foil hood or band stock, respectively, is expanded in essentially a horizontal direction; pulling-over of the foil hood or band stock, respectively, over the object by the essentially vertical movement of the lifting frame, wherein the foil hood or band stock, respectively, is pulled-off from the gripper device and is expanded in essentially a vertical direction; controlling the tension of the foil hood or band stock, respectively, during tentering in essentially a horizontal direction above the upper side of the object by controlled rolling off of the foil hood or band stock from the gripper device and the

reefing devices by rotating the rolls of the reefing devices in a direction opposite to the first rotation direction of the reefing devices utilized during the reefing step.

[0006] In the method in accordance with the present invention, for packaging objects the formed foil hood or band stock, respectively, is reefed onto several gripper means **device** movable in essentially horizontal direction, of a lifting frame moveable in vertical direction. Subsequently, the pushed-on foil hood or band stock, respectively, is tentered by the movement of ~~said~~ **the** gripper means **device** in the essentially horizontal direction such that ~~said~~ **the** tentered opening of ~~said~~ **the** foil hood or band stock, respectively, is larger than the horizontal projection of the good to be packed and wherein ~~said~~ **the** foil hood or band stock, respectively, is stretched in essentially horizontal direction. In a next step ~~said~~ **the** foil hood or band stock, respectively, is pulled over ~~said~~ **the** object by the essentially vertical movement of ~~said~~ **the** lifting frame, ~~said~~ **the** foil hood or band stock, respectively, being pulled off from ~~said~~ **the** gripper means **device** and being expanded in essentially vertical direction. The method in accordance with the present invention is characterized in that the tension of ~~said~~ **the** foil hood or band stock, respectively, on the upper side of the stack of goods is controlled. Hereby the horizontal stretch of ~~said~~ **the** foil on the upper side of ~~said~~ **the** good can be adjusted to the respective practical circumstances, to the contour of the stack of goods in particular, thereby avoiding excessive stretching and formation of thinned portions in ~~said~~ **the** foil and simultaneously achieving good bearing of ~~said~~ **the** stretched foil in the upper area of the good to be packed in particular.

[0007] In a preferred embodiment of the method, during tentering of ~~said~~ **the** foil hood or band stock, respectively, ~~said~~ **the** foil partially again is pulled off from ~~said~~ **the** gripper means **device**. Thereby it is made possible that a part of ~~said~~ **the** foil again is released during ~~said~~ **the** horizontal stretching operation. Thereby excessive stretching in areas with thin portions in ~~said~~ **the** foil are avoided, which in particular occur in positions of ~~said~~ **the** foil where ~~said~~ **the** gripper means **device** are located.

[0008] In another preferred embodiment of the present invention, the pulling-off speed of ~~said~~ **the** foil during tentering of ~~said~~ **the** foil hood or band stock, respectively, by controlled rolling down of ~~said~~ **the** foil from ~~said~~ **the** gripper means **device** is less than the speed of

horizontal movement of ~~said~~ the gripper ~~means~~ device. Thereby it is achieved that ~~said~~ the foil hood or band stock, respectively, continues to be stretched during tentering, however, with respect to traditional apparatuses the degree of stretching is reduced in the corner areas in which ~~said~~ the foil is pulled over the bow-shaped grippers such that excessive stretching in horizontal direction is avoided.

[0009] In order to achieve a good stretch in vertical direction during pulling-over of ~~said~~ the foil hood or band stock, respectively, over ~~said~~ the object on the pallet, in a further preferred embodiment ~~said~~ the pulling-off speed of ~~said~~ the foil during pulling-over is lower than the vertical speed of ~~said~~ the lifting frame.

[0010] In a particularly preferred embodiment of the method in accordance with the present invention reefing or pulling-off of ~~said~~ the foil hood or band stock, respectively, during reefing or tentering and/or pulling-off of ~~said~~ the foil hood or band stock, respectively, during pulling-over is caused by the movement of rolls, the outer surfaces of ~~said~~ the rolls shifting the portions of ~~said~~ the foil hood or band stock, respectively, pushed onto ~~said~~ the gripper ~~means~~ device. Thereby, the reefing or pulling-off speed, respectively, of ~~said~~ the foil hood or band stock, respectively, can be accurately controlled by the control of the speed of the rolls.

[0011] In a further embodiment the lower end of ~~said~~ the foil hood or band stock, respectively, in the end phase of pulling-over is held for creating a maximum vertical stretch and an understretch such that the lower end of ~~said~~ the foil hood or band stock, respectively, fixedly bears on the bottom side of the stack of goods on pallet. In a preferred embodiment holding of ~~said~~ the foil hood or band stock, respectively, can be effected by the above-described rolls which press ~~said~~ the foil hood or band stock, respectively, to ~~said~~ the gripper ~~means~~ device. However, also other ~~means~~ device for holding ~~said~~ the foil hood or band stock, respectively, can be provided for.

[0012] The apparatus in accordance with the present invention for packaging objects with a stretch foil includes a lifting frame movable in essentially vertical direction, for pulling-over ~~said~~ the foil hood or band stock, respectively, over the stack of goods as well as gripper ~~means~~ device provided for an ~~said~~ the lifting frame, for gripping and expanding ~~said~~ the foil hood or band stock, respectively, in essentially horizontal direction. Furthermore, on ~~said~~ the

gripper means device reefing means device for reefing and pulling-off said the foil hood or band stock, respectively, from said the gripper means device are provided for. Said The reefing means device are characterized in that they comprise control means device for controlling expansion of said the foil hood or band stock, respectively, in the area of the upper side of said the stack of goods, whereby a desired horizontal stretch of said the foil can be adjusted and excessive stretching is avoided.

[0013] In a preferred embodiment said the reefing means device permit the partial pulling-off of said the foil hood or band stock, respectively, from said the gripper means device during the essentially horizontal movement of said the gripper means device. Thereby, the horizontal stretch of said the foil is reduced and thin positions in the foil, in particular in positions where said the foil runs over the bow-shaped sections at the upper end of said the grippers, are avoided.

[0014] In a preferred embodiment said the control means device can control the pulling-off speed during the essentially horizontal movement of said the gripper means device and/or the vertical movement of said the lifting frame. The control therein is effected in advantageous manner such that the pulling-off speed during the essentially horizontal movement of said the gripper means device is lower than the speed of said the gripper means device and/or that the pulling-off speed during the essentially vertical movement of said the lifting frame is lower than the speed of said the lifting frame. Hereby a certain degree of expansion of said the foil hood or band stock, respectively, in vertical and horizontal directions is achieved.

[0015] In a further embodiment of said the apparatus in accordance with the present invention said the reefing means device comprise at least one roll which can be brought to bear on said the lifting frame and rolls up or rolls off said the foil hood or band stock, respectively, onto or from said the gripper means-

device.

[0016] In order to achieve maximum understretch of said the foil hood or band stock, respectively, in a further embodiment a holding means device is provided for at each reefing

means, device, for holding said the foil at said the gripper means device during the pulling-over phase. Said The holding means device in an embodiment of the apparatus can be formed by the above-described rolls which that press said the foil hood or band stock, respectively, against said the gripper means device during the pulling-over end phase.

BRIEF DESCRIPTION OF DRAWINGS

[0017] Further features, advantages and details of the present invention result from the following detailed description of a preferred embodiment with reference to the attached drawing, wherein

[0018] FIG. 1 shows a perspective view of the essential parts of an apparatus for packaging objects in accordance with an embodiment of the present invention; and

[0019] FIGs. 2A to F 2F show the individual steps of an embodiment of the method in accordance with the present invention.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENT

[0020] The apparatus shown in FIG. 1, for packaging objects 1 comprises a supply roll not shown, for a folded foil hose 3 which is unwound from said the supply roll and fed to a central packaging unit. Said The packaging unit comprises a frame which that is moved in vertical direction over said the stack of goods 1 for packaging said the objects. ~~Of said packaging unit~~ However, only the components of the packaging unit relevant for the invention are shown for better elucidation.

[0021] As can be seen from FIG. 1, said the foil hose 3 is guided over a deflection rod 4 vertically in downward direction to a welding and cutting means device 5 when a foil hood is to be formed. In said the welding and cutting means ~~said~~ device the foil hose 3 is closed by welding at a desired length and is cut off and the end of said the foil hose opposite to said the welded end is reefed onto the four gripper means device 8 provided for on said the frame and subsequently is tensioned in horizontal direction by horizontal movement of said the gripper means device such that an opened foil hood 6 is created. Said The gripper means device shown in FIG. 1 ~~consist of~~ includes bow-like frame sections 8a and bow supports 8b. Said The

bow-like frame sections 8a and ~~said~~ the bow supports 8b are formed C-shaped and thus pre-define the corners of ~~said~~ the foil hood. If creation of a foil hood closed on its upper side is not intended, ~~said~~ the welding ~~means device~~ can be done without and a hose piece (band stock) is cut to a given length. In the following, however, a foil hood is talked about.

[0022] Figs. 2A to 2E ~~2F~~ show the steps of the method in accordance with the present invention, for packaging ~~said~~ the stack of goods 1 with ~~said~~ the foil hood 6, wherein in the figures two gripper ~~means devices~~ 8 are shown respectively. As can be seen from the figures, a reefing ~~means device~~ 9 is arranged on ~~said~~ the gripper ~~means device~~ respectively, which pushes ~~said~~ the foil hood onto ~~said~~ the respective gripper ~~means device~~ or pulls it off therefrom. ~~Said~~ The reefing ~~means device~~ 9 includes a roll 10 as well as a drive 11. ~~Said~~ The reefing ~~means device~~ is fixed on a support 12 ~~which that~~ again is arranged in a guide 14 and is horizontally shiftable. The bow piece of ~~said~~ the gripper ~~means device~~ 8 is fixed to an arm 13. ~~Said~~ The arm also is arranged in ~~said~~ the guide 14 and is shiftable in horizontal direction.

[0023] As is shown in FIG. 2A, after welding together and cutting off of ~~said~~ the foil hood 6 reefing of the latter onto ~~said~~ the gripper ~~means device~~ 8 is carried out. For this purpose ~~said~~ the arm 13 is moved into a position in which the cross section of ~~said~~ the frame is smaller than the contour of ~~said~~ the stack of goods. In addition, the outer surfaces of ~~said~~ the rolls 10 come into contact with the outsides of ~~said~~ the foil hood. By rotating ~~said~~ the roll of ~~said~~ the left-hand gripper ~~means device~~ in a clockwise direction and rotating ~~said~~ the roll of ~~said~~ the right-hand gripper ~~means device~~ in counterclockwise direction (as indicated by the arrows in FIG. 2A) now ~~said~~ the foil hood can be reefed onto ~~said~~ the bow-like frame section of ~~said~~ the gripper ~~means device~~ 8. In FIG. 2B the condition of ~~said~~ the foil hood after reefing onto ~~said~~ the gripper ~~means device~~ 8 is shown.

[0024] In order to now stretch ~~said~~ the foil hood 6 in horizontal direction, ~~said~~ the gripper ~~means devices~~ 8 are moved in horizontal direction to the right-hand and/or left-hand sides, respectively. This method step can be seen from FIG. 2C, wherein the movement of ~~said~~ the gripper ~~means device~~ is indicated by arrows. For avoiding that ~~said~~ the foil hood on the corners or the gripper action area is exposed to such strong expansion forces that thin portions are created in the foil which might cause damage of ~~said~~ the foil, both rolls 10 of ~~said~~ the

pushing-on means device 9 are moved into the direction opposite to that of the preceding method step, this permitting slow rolling-off of said the foil hood during said the horizontal stretching operation. Herein it is essential that the speed of said the rolls is adjusted such that the rolling-off speed from said the gripper means device is less than the horizontal speed of said the gripper means device since otherwise the desired stretch could not be made possible. In total it is achieved by this method step that the horizontal stretch is reduced in controlled manner as controlled to the traditional apparatuses.

[0025] After the horizontal stretch having been carried out now said the frame is moved vertically in downward direction, wherein said the rolls 10 do not carry out a rotational movement until the foil hood touches the upper end of said the stack of goods. Said The method step can be seen from FIG. 2D.

~~In FIG. 2E two method steps during pulling-over of said foil hood over said stack of goods are shown, wherein said foil hood is in contact with said stack of goods. As soon as said foil hood touches said stack of goods, beside said vertical movement of said frame a rotational movement of said rolls 10 of said gripper means 8 starts, wherein said roll of said left-hand gripper means rotates in counterclockwise direction and said roll of said left-hand gripper means moves in clockwise direction. By said rotational movement of said rolls rolling-down of said foil hood from said gripper means is controlled and thereby a desired vertical stretch of said foil hood is achieved. The speed of said rolls therein is adjusted such that the rolling-down speed of said foil hood from said gripper means is lower than the vertical speed of said lifting frame since otherwise the desired vertical stretch could not be produced.~~

~~FIG. 2F shows the method step finishing said pulling-over operation. After said frame with the respective gripper means is located below the lower end of said stack of goods and said foil hood is rolled down from the respective gripper means to a high degree, the lower end of said foil hood is held on said gripper means in order to thus permit maximum vertical stretch as well as an understretch. Thereby fixed bearing of said lower~~

~~end of said foil hood on said stack of goods after sliding down from said gripper means is rendered possible.~~

~~Therefore, it also is conceivable that said gripper means in case of pressed-on rolls moved towards one another until under said pallet for thereafter completely releasing said foil which already partly moved under said pallet. During the movement of said gripper means in inward direction under said load said foil under the effect of said rolls is released with a lower speed than the speed of the horizontally moving gripper means.~~

[0026] In FIG. 2E two method steps during pulling-over of the foil hood over the stack of goods are shown, wherein the foil hood is in contact with the stack of goods. As soon as the foil hood touches the stack of goods, beside the vertical movement of the frame a rotational movement of the rolls 10 of the gripper device 8 starts, wherein the roll of the left-hand gripper device rotates in a counterclockwise direction and the roll of the left-hand gripper device moves in a clockwise direction. By the rotational movement of the rolls rolling-down of the foil hood from the gripper device is controlled and thereby a desired vertical stretch of the foil hood is achieved. The speed of the rolls therein is adjusted such that the rolling-down speed of the foil hood from the gripper device is lower than the vertical speed of the lifting frame since otherwise the desired vertical stretch could not be produced.

[0027] FIG. 2F shows the method step finishing the pulling-over operation. After the frame with the respective gripper device is located below the lower end of the stack of goods and the foil hood is rolled down from the respective gripper device to a high degree, the lower end of the foil hood is held on the gripper device in order to thus permit maximum vertical stretch as well as an understretch. Thereby fixed bearing of the lower end of the foil hood on the stack of goods after sliding down from the gripper device is rendered possible.

[0028] Therefore, it also is conceivable that the gripper device in case of pressed-on rolls moved towards one another until under the pallet for thereafter completely releasing the foil that already partly moved under the pallet. During the

movement of the gripper device in inward direction under the load the foil under the effect of the rolls is released with a lower speed than the speed of the horizontally moving gripper device.

ABSTRACT OF THE DISCLOSURE

In a method for packaging objects an object using a hose-shaped stretch foil ~~guided in run-like manner as hose of lateral folds in particular,~~ a foil hood (6) harmonized to the good to be packed having laterally extending folds guided axially with respect to the stretch foil and along a length of the object, a foil hood sized to a shape of the object to be packaged is formed, which hood is reefed onto several gripper means ~~(8)~~ devices movable in essentially horizontal direction, of a lifting frame movable in essentially a vertical direction. Subsequently the The reefed foil hood (6) is tentered in an essentially horizontal direction by the movement of the gripper means ~~(6)~~ device such that the tentered opening of ~~said the~~ the foil hood is larger than the contour of the object (1) to be packed and wherein ~~said the~~ the foil hood (6) is expanded in essentially horizontal direction. ~~In a subsequent step said The~~ then pulled over ~~said the~~ the object (1) by the essentially vertical movement of ~~said the~~ the lifting frame, wherein ~~said the~~ the foil hood (6) is pulled off from ~~said the~~ the gripper means ~~(8)~~ device and is expanded in essentially vertical direction. ~~The method is characterized in that the tension of said foil hood (6) is controlled in the area of the upper side of the stack of goods (1).~~

Fig. 2E